

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

REC'D 14 JAN 2005

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Applicant's or agent's file reference GB020050	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB 03/01790	International filing date (day/month/year) 28.04.2003	Priority date (day/month/year) 24.10.2002
International Patent Classification (IPC) or both national classification and IPC G06F17/60		
Applicant INTERNATIONAL BUSINESS MACHINES CORPORATION		

1. This International preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 7 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 7 sheets.

3. This report contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain documents cited
 - VII ☐ Certain defects in the International application
 - VIII ☐ Certain observations on the International application

Date of submission of the demand 17.05.2003	Date of completion of this report 12.01.2005
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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/GB 03/01790**

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17):*

Description, Pages

1, 2, 6-16 as originally filed
3-5, 5a filed with telefax on 20.12.2004

Claims, Numbers

1-20 filed with telefax on 20.12.2004

Drawings, Sheets

1/8-8/8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-20
	No: Claims	
Inventive step (IS)	Yes: Claims	1-20
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-20
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1: DALY D., KAR G., SANDERS W.H.: "Modeling of Service-Level Agreements for Composed Services" PROC. (LECTURE NOTES IN COMP. SCI. VOL 2506), vol. 2506, 21 October 2002 (2002-10-21), pages 4--15, XP001165741
D2: GB-A-2 349 715 (MITEL CORP) 8 November 2000 (2000-11-08)

1. Independent Claims

- 1.1 Regarding independent claim 1, document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document):

A method for ~~ranking~~ *providing* services in a web services architecture having a hierarchy of services, wherein a service at a first level in the hierarchy, is responsive to a request from an originating service requester to request a service at a lower level in the hierarchy, the method comprising:

(Page 5, lines 16-28)

the originating service requester requesting at least a first service at a first level of the hierarchy, and indicating a preference regarding one or more services;

(Page 5, lines 8-14)

each requested service, at each level of the hierarchy, using a directory to find a set of possible lower-level services to implement the requested service;

(Page 4, Introduction, line 1 - page 5, line 6)

~~and a ranking machine having a choice algorithm based on the preference and applying the choice algorithm to the set of possible lower-level services, at each level of the hierarchy, to provide a sequence of preferred services.~~

The subject-matter of claim 1 differs from this known method in that web services are provided using originating requestor preference based ranking at each level of the hierarchy of possible services.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as improving web service provision in a web service hierarchy.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The ranking of web services from various non-hierarchically organised services is known from D2 (see page 10, lines 8-13), however the feature of using of an originating requestor preference based ranking algorithm, in particular at each level, down the tree of potential suppliers is not disclosed or hinted at and has the advantages of increasing flexibility and requester control of the services selected. The feature is not disclosed in, nor hinted at in any document on file.

- 1.2 Regarding independent claim 13, document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document):

A web services architecture comprising:

an originating service requestor;

a hierarchy of services in which a service of a first level in the hierarchy is responsive to a request from the originating service requestor to request a service of a lower level in the hierarchy;

(Page 5, lines 16-28)

a directory for finding services in the hierarchy;

~~a ranking machine with means for applying a choice algorithm for services, based on the originating service requestor indicating a preference regarding one or more services;~~

wherein, at each level of the hierarchy, the directory identifies a set of possible lower-level services

(Page 4, Introduction, line 1 - page 5, line 6)

~~and the ranking machine applies the choice algorithm to the set of possible lower-level services, at each level of the hierarchy, to provide a sequence of preferred services.~~

The subject-matter of claim 13 differs from this known architecture in that web services are provided using originating requestor preference based ranking at each level of the hierarchy of possible services.

The subject-matter of claim 13 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as improving web service provision in a web service hierarchy.

The solution to this problem proposed in claim 13 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The ranking of web services from various non-hierarchically organised services is known from D2 (see page 10, lines 8-13), however the feature of using of an originating requestor preference based ranking algorithm, in particular at each level, down the tree of potential suppliers is not disclosed or hinted at and has the advantages of increasing flexibility and requester control of the services selected. The feature is not disclosed in, nor hinted at in any document on file.

- 1.3 Regarding independent claim 20, document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document):

A computer program product for a web services architecture having a hierarchy of services, wherein a service of a first level of the hierarchy is responsive to a service request from an originating service requestor to request a service of a lower level in the hierarchy,

(Page 5, lines 16-28)

the computer program product comprising computer readable program code for performing the following steps in response to the originating service requestor requesting at least a first service at a first level of the hierarchy, and indicating a preference regarding one or more services:

(Page 5, lines 8-14)

each requested service, at each level of the hierarchy, using a directory to find a set of possible lower-level services to implement the requested service;

(Page 4, Introduction, line 4 - page 5, line 6)

~~and a ranking machine having a choice algorithm based on the preference
and applying the choice algorithm to the set of possible lower-level services;
at each level of the hierarchy, to provide a sequence of preferred services.~~

The subject-matter of claim 20 differs from this known computer program product in that web services are provided using originating requestor preference based ranking at each level of the hierarchy of possible services.

The subject-matter of claim 20 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as improving web service provision in a web service hierarchy.

The solution to this problem proposed in claim 20 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The ranking of web services from various non-hierarchically organised services is known from D2 (see page 10, lines 8-13), however the feature of using of an originating requestor preference based ranking algorithm, in particular at each level, down the tree of potential suppliers is not disclosed or hinted at and has the advantages of increasing flexibility and requester control of the services selected. The feature is not disclosed in, nor hinted at in any document on file.

2. Dependent Claims

Claim groups 2-12 and 14-19 are dependent on claims 1 and 13 respectively and as such also meet the requirements of the PCT with respect to novelty and inventive step.

The user can do this by filtering the returned list of companies from the search because the search returned information to the user directly and the user is in control of what happens next.

A difference arises if the book purchase request is being done as part of the function of a service that is being provided by someone else. For example, the user may be building a library of StarTrek books. The user uses a 'Build a library' selection and gets back a list of suitable sellers. The user places his Get-me-a-library-for-StarTrek request to this supplier who will do the job. However, the user is now no longer in the position to use his favourite list of Book Sellers as the book-buying function is now being handled by someone else. In effect, they use their preferred suppliers instead of the users.

One result of the described invention provides a way of getting books (or other items) purchased with the user's preferred sellers and not the intermediaries.

User:	Library	Seller1:	UserPreferred
	Builder:		Seller2:

Prior Art: Build a library--->Buy book1----->Buy
Invention: Build a library--->Buy book1----->Buy

The described method and system relates to how WSDL/UDDI requests are biased according to the preference of the originator. What conditions influence a user's preferences are not discussed and are up to the user. Examples of conditions which may influence a user's preference include the standards of cost, efficiency, speed and reliability.

According to a first aspect of the present invention there is provided a method for ranking services in a web services architecture having a hierarchy of services, wherein a service at a first level in the hierarchy is responsive to a request from an originating service requestor to request a service at a lower level in the hierarchy, the method comprising: the originating service requestor requesting at least a first service at a first level of the hierarchy, and indicating a preference regarding one or more services; each requested service, at each level of the hierarchy, using a directory to find a set of possible lower-level services to implement the requested service; and a ranking machine having a choice algorithm based on the preference and applying the choice

algorithm to the set of possible lower-level services, at each level of the hierarchy, to provide a sequence of preferred services.

The lower-level services may be service requestors or service providers.

In one embodiment, the set of possible lower-level services may be referred to the ranking machine from the directory and a preferred sequence may be returned by the ranking machine to the directory. The step of referring to the ranking machine may not be visible to the service using the directory.

In another embodiment, the set of possible lower-level services may be sent by the service using the directory to the ranking machine and a preferred sequence may be returned by the ranking machine to the service.

A single result or a sequence of results may be returned to the service using the directory.

Preferably, lower-level invocations of services in the hierarchy are not visible to higher-level services.

The preference of the originating service requestor may rank services in an order in which the originating service requestor wishes to use the services, may exclude services from being used, and/or may provide other selection influencing criteria.

The preference of the originating service requestor may be based on quality of service criteria including, for example, cost, efficiency, speed and reliability.

In a situation in which there is an originating service requestor's preference, the preference may override a selection by the service using the directory. If the preferred service is not available, a subsequent service may be obtained by reference to the originating service requestor's preference.

In a situation in which there is no stored originating service requestor's preference, the service using the directory may make the selection.

According to a second aspect of the present invention there is provided a web services architecture comprising: an originating service

requestor; a hierarchy of services in which a service of a first level in the hierarchy is responsive to a request from the originating service requestor to request a service of a lower level in the hierarchy; a directory for finding services in the hierarchy; a ranking machine with means for applying a choice algorithm for services, based on the originating service requestor indicating a preference regarding one or more services; wherein, at each level of the hierarchy, the directory identifies a set of possible lower-level services and the ranking machine applies the choice algorithm to the set of possible lower-level services, at each level of the hierarchy, to provide a sequence of preferred services.

The ranking machine is preferably connected to the directory by a port and the set of possible services is referred to the ranking machine by the directory and the sequence of preferred services is returned to the directory by the ranking machine.

A service of a first level may find a service of a lower level by means of a UDDI directory. The ranker machine may have a port on the UDDI directory and may process flows turning TModel bags into a selected set of TModels.

Each UDDI operation may be referred to the ranking machine and may be returned as a sequence conforming with the service requestor's preference.

Underlying UDDI application code may carry out the referral and may append the location of the ranker machine to subsequent XML flow.

According to a third aspect of the present invention there is provided a computer program product for a web services architecture having a hierarchy of services, wherein a service of a first level of the hierarchy is responsive to a service request from an originating service requestor to request a service of a lower level in the hierarchy, the computer program product comprising computer readable program code for performing the following steps in response to the originating service requestor requesting at least a first service at a first level of the hierarchy and indicating a preference regarding one or more services:

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each requested service, at each level of the hierarchy, using a directory to find a set of possible lower-level services to implement the requested service; and

a ranking machine having a choice algorithm based on the preference and applying the choice algorithm to the set of possible lower-level services, at each level of the hierarchy, to provide a sequence of preferred services.

Embodiments of the present invention will now be described, by way of examples only, with reference to the accompanying drawings, in which:

CLAIMS

1. A method for ranking services in a web services architecture having a hierarchy of services (401, 406, 408, 410), wherein a service at a first level in the hierarchy is responsive to a request from an originating service requestor (401) to request a service at a lower level in the hierarchy, the method comprising:

the originating service requestor (401) requesting at least a first service at a first level of the hierarchy, and indicating a preference regarding one or more services;

each requested service, at each level of the hierarchy, using a directory (411) to find a set of possible lower-level services to implement the requested service; and

a ranking machine (405) having a choice algorithm based on the preference and applying the choice algorithm to the set of possible lower-level services, at each level of the hierarchy, to provide a sequence of preferred services.

2. A method as claimed in claim 1, wherein the lower-level services are service requestors or service providers.

3. A method as claimed in claim 1 or claim 2, wherein the set of possible lower-level services is referred to the ranking machine (405) from the directory (411) and a preferred sequence is returned by the ranking machine (405) to the directory.

4. A method as claimed in claim 3, wherein the step of referring to the ranking machine (405) is not visible to the service using the directory (411).

5. A method as claimed in claim 1 or claim 2, wherein the set of possible lower-level services is sent by the service using the directory (411) to the ranking machine (405) and a preferred sequence is returned by the ranking machine (405) to the service.

6. A method as claimed in any one of the preceding claims, wherein a single result or a sequence of results is returned to the service using the directory (411).

7. A method as claimed in any one of the preceding claims, wherein lower-level invocations of services in the hierarchy are not visible to higher-level services.

8. A method as claimed any one of the preceding claims, wherein the preference of the originating service requestor (401) ranks services in an order in which the originating service requestor (401) wishes to use the services, excludes services from being used, and/or provides other selection influencing criteria.

9. A method as claimed in any one of the preceding claims, wherein the preference of the originating service requestor (401) is based on quality of service criteria including cost, efficiency, speed and reliability.

10. A method as claimed in any one of the preceding claims, wherein where there is an originating service requestor's preference, the preference overrides a selection by the service using the directory (411).

11. A method as claimed in any one of the preceding claims, wherein if the preferred service is not available, a subsequent service is obtained by reference to the originating service requestor's preference.

12. A method as claimed in any one of claims 1 to 9, wherein if there is no stored originating service requestor's preference, the service using the directory (411) makes the selection.

13. A web services architecture comprising:
an originating service requestor (401);
a hierarchy of services (401, 406, 408, 410) in which a service of a first level in the hierarchy is responsive to a request from the originating service requestor (401) to request a service of a lower level in the hierarchy;
a directory (411) for finding services in the hierarchy;
a ranking machine (405) with means for applying a choice algorithm for services, based on the originating service requestor indicating a preference regarding one or more services;
wherein, at each level of the hierarchy, the directory (411) identifies a set of possible lower-level services and the ranking machine (405) applies the choice algorithm to the set of possible lower-level services, at each level of the hierarchy, to provide a sequence of preferred services.

14. A web services architecture as claimed in claim 13, wherein the lower-level services are service requestors or service providers.

15. A web services architecture as claimed in claim 13 or claim 14, wherein the ranking machine (405) is connected to the directory (411) by a port (412) and the set of possible services is referred to the ranking machine (405) by the directory (411) and the sequence of preferred services is returned to the directory (411) by the ranking machine (405).

16. A web services architecture as claimed in any one of claims 13 to 15, wherein a service of a first level finds a service of a lower level by means of a UDDI directory (411).

17. A web services architecture as claimed in claim 16, wherein the ranker machine (405) has a port (412) on the UDDI directory (411) and processes flows turning TModel bags into a selected set of TModels.

18. A web services architecture as claimed in claim 16 or claim 17, wherein each UDDI operation is referred to the ranking machine (405) and returned as a sequence conforming with the service requestor's preference.

19. A web services architecture as claimed in any one of claims 16 to 18, wherein underlying UDDI application code carries out the referral and appends the location of the ranker machine (405) to subsequent XML flow.

20. A computer program product for a web services architecture having a hierarchy of services (401, 406, 408, 410), wherein a service of a first level of the hierarchy is responsive to a service request from an originating service requestor (401) to request a service of a lower level in the hierarchy, the computer program product comprising computer readable program code for performing the following steps in response to the originating service requestor (401) requesting at least a first service at a first level of the hierarchy, and indicating a preference regarding one or more services:

each requested service, at each level of the hierarchy, using a directory (411) to find a set of possible lower-level services to implement the requested service; and

a ranking machine (405) having a choice algorithm based on the preference and applying the choice algorithm to the set of possible lower-level services, at each level of the hierarchy, to provide a sequence of preferred services.